International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

Linking Building-Circulation Typology and Way-Finding in Architecture

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Abstract

Understanding how people interpret building circulation is a crucial topic for architectural design and planning. To assess this, a proposal of a cognitive–architectural description of circulation typology. Based on a prominent architectural case, explaining modifications in building layouts. Hereby, developing three distinct circulation types, linear, curved, and grid- based, which differ in their geometrical structure but are comparable in their functional organizations and topological organizations.. Based on the subjective judgments, the linear circulation is the easiest of the three circulation types and the grid based the most difficult, while the curved circulation is intermediate of the two. This is only partially in line with the results of the objective analyses.

1.Introduction

The idea of movement through space is one of the central themes in architectural theory, design, planning and practice. Architectural shapes and building layouts are revealed literally step by step as finding difficulties based on the circulation typology and planning.

You explore a building envelope ans even outside of building envelope. A building's circulation is the key factor organizing its layout ,functionality and hence is of interest for both architects and other professionals involved in post-occupancy evaluation. One prerequisite for linking circulation types with way-finding performance is to establish a formal and descriptive method of description that (a) creates a link between building circulation and way-finding difficulty and

(b) explores new ways of formally analyzing different types of building configurations and planning. Argument that such a method can be developed through analysis of a spatial typology of circulation types. To achieve this, we combine two complementary methods: spatial analysis (mainly space formulation), and ratings of anticipated way-finding difficulty based on floor-plan evaluations and study. First, we identify 'circulation types': prototypical configurations that help organizing the layout of a building. Then, we develop a method for systematically varying building circulation and try to apply it to an existing architectural layout, thus

constructing examples of the various circulation types and patterns. The resulting circulation variations differ in structures but remain comparable in their functional organization and planning. Our intention is to contribute methodologically and theoretically to understanding how different building circulation types can be analyzed and how floor-plan analyses can help predict way-finding.

2. Literature study

2.1. Spatial configuration, circulation, and way-finding

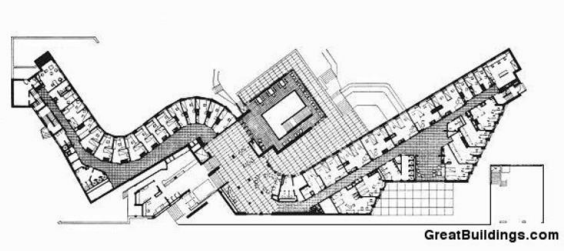
Way-finding consists not only of locomotion but also of manifold cognitive processes. The configuration of space and visual accessibility and connectivity between locations are central factors that influence how easy or hard it is to identify routes within a building or even outside a building like approach, entrance etc. In most of way-finding situations, the destinations are not directly visible (e.g. when configurational elements such as walls or partitions block the way-finder's view). Way-finders typically need to reason objectives about the relationships between different parts of a space to understand a building's spatial configuration. Spatial analysis that examines spatial configuration and visual accessibility has largely been associated with being able to predict both locomotion and way-finding decisions not addressing any major difficulty in the flow of footfall. Consequently, spatial analyses are especially valuable for architects and planners, who may seek to evaluate and reason the way-finding difficulty of their designs based solely on floor-plan analyses. Thus this work focus on anticipated way-finding difficulties using floor-plan analysis. However, it is not entirely clear how building circulation types affect the ease or difficulty of way-finding for the user. Good form is easily appraised, and once the ordering principle has been grasped, it can support understanding the complexity of a planned layout and can then be used to inform way-finding decisions for the user. Layouts may be said to vary in their closeness to a 'good form'; comprehending and understanding a layout is easier when the layout has an overall pattern that can be apprehended as a single simple shape or form, perhaps allowing easy categorization. A square has better form than a rhombus; a circle has better form than a lopsided oval. However, as circulation types have been assessed rather informally or formally, no accepted typology of building circulation exists. Moreover, most architectural settings are not based on a single form or pattern but comprise combinations of circulation types. These can be constructed from various geometric set of rules or by combining elements from the different types.

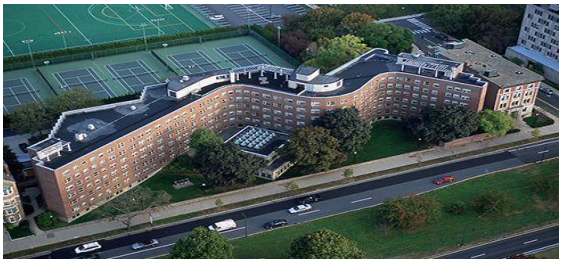
2.2. Circulation types

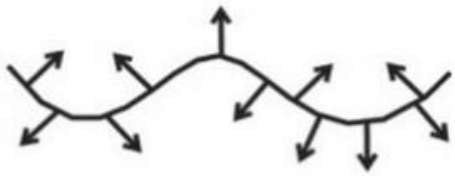
In this particular study, we focus explicitly on simple, two-dimensional geometric shapes to illustrate their general principles of spatial organization. Development of a description of circulation typology by defining the physical characteristics of circulation patterns and systems. Limiting classification to three major types and illustrate the typology with a set of prominent

architectural cases. The most fundamental circulation type is a linear layout as it allows the greatest number of straight views. Linearity extends from an ordered linear path to a random or axial layout (Figure 1). This circulation, as any other circulation type, can have various spatial characteristics; it can be wide or narrow, short or long, and so on. The linear system can differ in having single or multiple circulation channels and symmetry in the organization of its functional typological units. The next type of circulation is a curved system, which is structured by central symmetry or rotational axis. It varies from focal to concentric and spiral patterns (Figure 2). This curved circulation is characterized by central space around which functional units are organized.

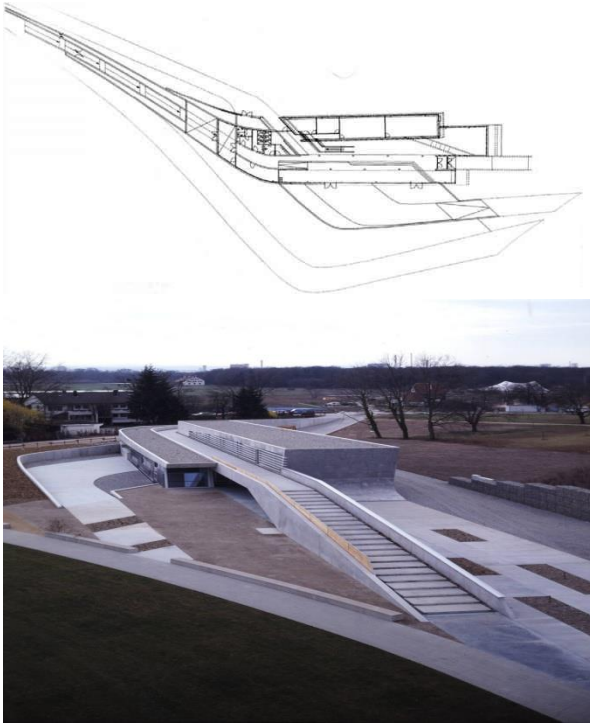
The circulation in these buildings is related to the central space or courtyard. Central space here is meant as an organizing force which provides a sense of orientation along a circular movement. In the case of curved spatial organization, the movement is result of rotation with a specifiedradius. Visual contact with a central, focal point, as in the case of the Guggenheim Museum (Figure 2(a)), allows the maintenance of directional references for the user. Without contact with the centre, way-finding can become confused following several turns and paths.







(a)



(b)

(a)

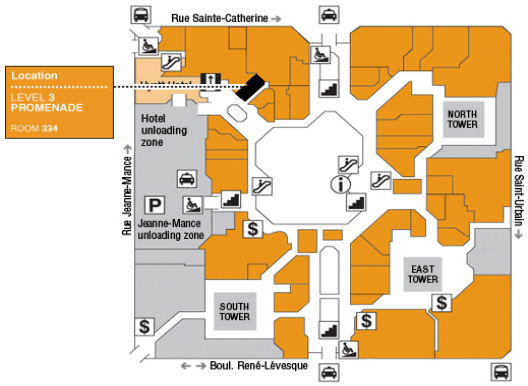
Figure 1. Various types of linear circulation: (a) a linear, serpentine path. Baker House, MIT, architect Alvar Alto; (b) a linear, bent path, Landscape Formation One, architect Zaha Hadid .

(b)

Figure 2. Various types of curved circulation systems: (a) a spiral, centralized path, Guggenheim Museum, architect F. L. Wright, ; (b) a concentric path, Apple Partners 2, architects Foster& Partners.

The last of circulation types is a grid-based or network system. This system is evolved by repetition of a dominant pattern across different scales and sizes. It can be based on a grid, scatter-point, or hierarchical network see (Figure 3). Spatial units in this system follow a certain coordination system of structure. In addition to the coordinated grid, such circulation can be based on a nested space system that is described by a sequence of units going from the largest one to the smallest.

(a)



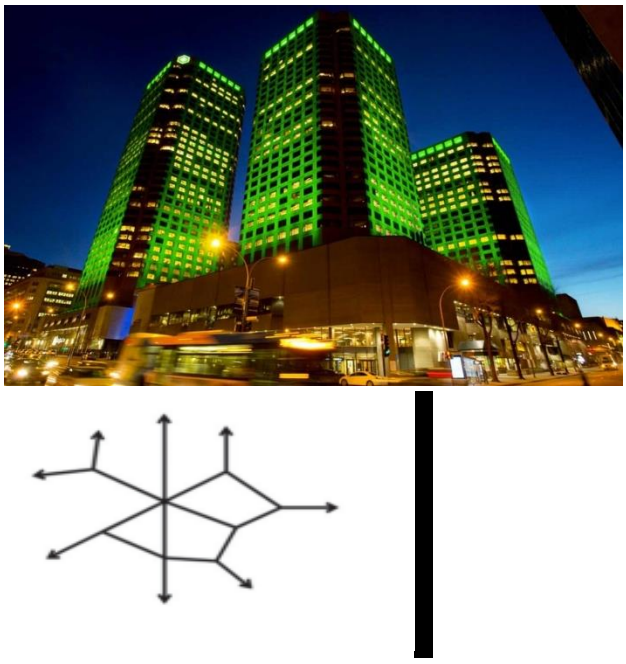
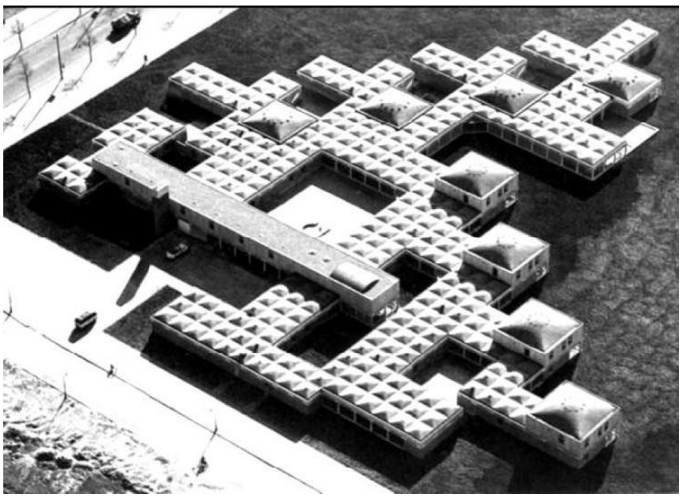


Figure 3. Various types of grid-based circulation systems: (a) grid, network path, The Israel Museum, architect Al Mansfeld, ;(b) hierarchical network path, Place Desjardins, architects La Haye and Oulette .

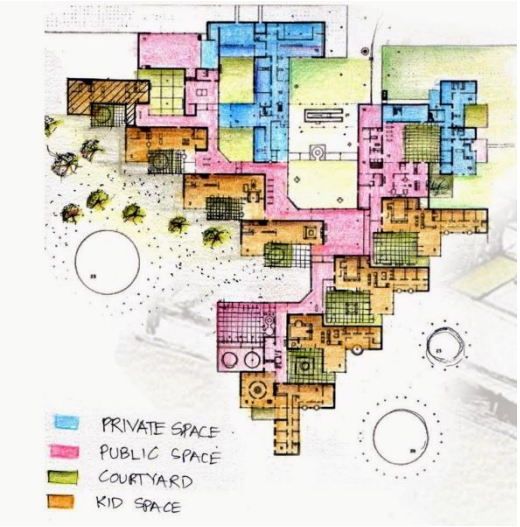
2.3. Case study

The Municipal Orphanage

The Amsterdam Municipal Orphanage, designed by Aldo van Eyck between 1955 and 1957, as a case study due to the complex arrangement of the spaces within its layout and planning. In contrast to traditional institutional buildings, the Orphanage does not order its functions hierarchically in a static composition governed by a central axis but unites a multiplicity of intersecting architectural volumes in one complex relationship (Figure 4).



(a)



(b)

Figure 4. (a) Amsterdam Municipal Orphanage. Arch. Aldo van Eyck; (b) floor plan.

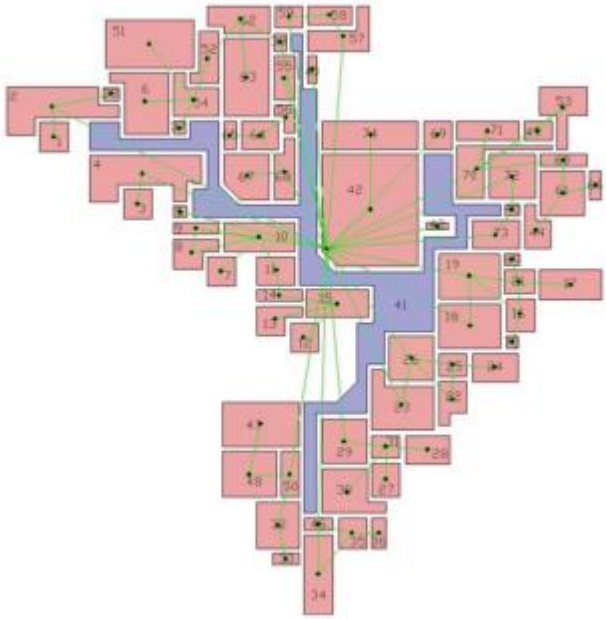
3. Methods

We used the three basic types introduced in the previous sections: grid-based, linear and curved.

To simplify the circulation and develop inferences on how circulation can make differences in way-findings difficulties and spatial configuration.

3.1. Grid-based circulation

Figure 5(a) shows a boundary graph overlapping with the original layout of the Orphanage. It has diverse components: elements of physical construction, decorative objects, textures, materials, and so forth.



(a)

Figure 5. (a) Space-boundary polygons of the grid-based circulation and its boundary graph

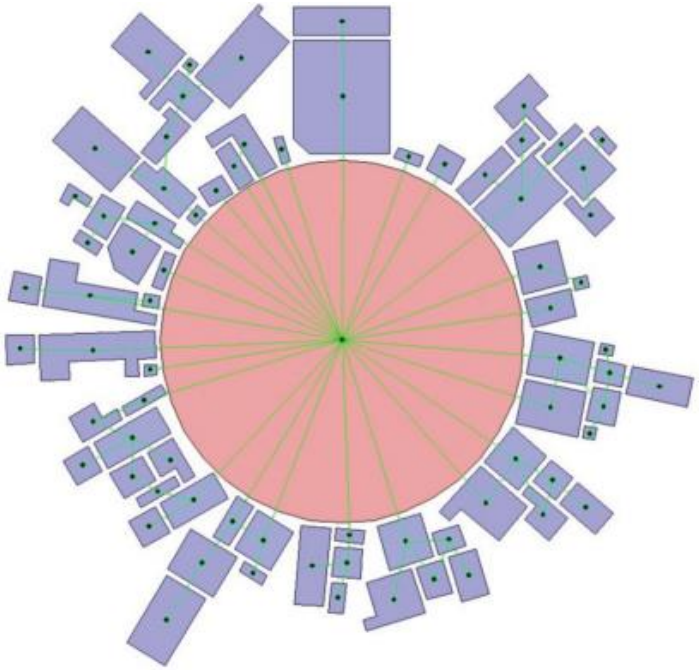
3.2. Linear and curved circulations

Based on the extracted graph of the topological relations between the functional units (Figure

5(a)), we developed a linear version of the circulation. The original building has a strong hierarchy of major and minor corridors in a composite style; in the linear layout, the main circulation space was straightened into a line in which the hierarchy of the units' clusters is the

same as the grid-based circulation, but the way-finding is not complex .The last variant is the curved one. We developed this system in such a way that the major and the minor corridors generate circular movement while keeping the order of connections and topological relations unchanged and untouched (Figure 6(b)).

(a)



(b)

Figure 6. Space-boundary polygons (a) of the linear circulation with overlapped boundary graph; (b) of the curved circulation and its boundary graph.

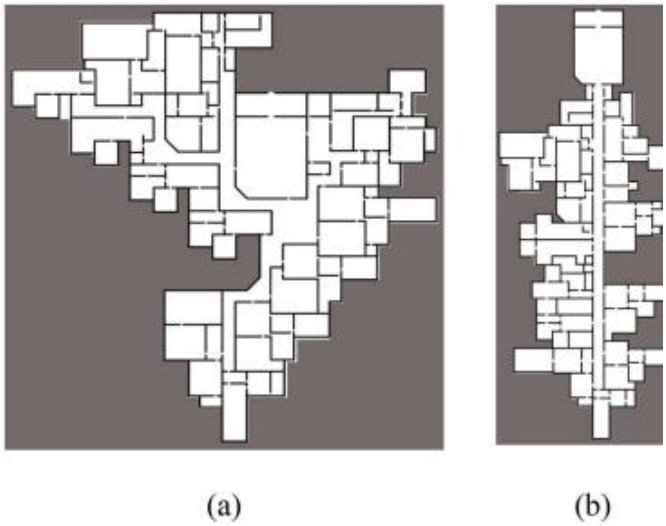


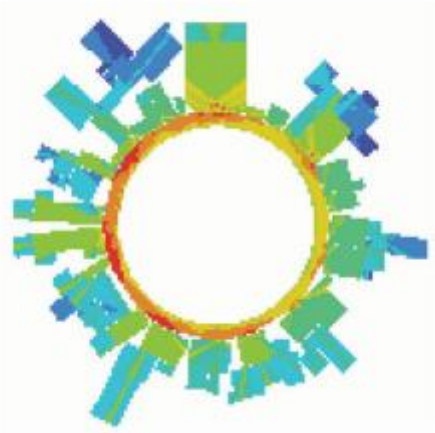
Figure 7. Circulation modifications; (a) grid-based circulation, (b) linear circulation, (c) curved circulation

4. Results

Although the three circulation alternatives share the same topological graph, they differ significantly in their spatial complexity, size, and space.

(a)

(b)



(c)

Figure 8. (a) grid-based circulation system, coloured by connectivity (high by red and low by blue); (b) linear circulation system, coloured by connectivity; (e) curved circulation system, coloured by connectivity.

5. Inferences

The linear circulation is the easiest of the three circulation types and the grid based the most

difficult, while the curved circulation is intermediate of the two.

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